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Thank you.

Burton A. Patton  
Vice President

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# USER MANUAL

## MODEL 1004A High Speed, Multipoint Short Range Modem



**PATTON**  
**Electronics Co.**



An ISO-9001  
Certified Company

Part# 07M1004A-C  
Doc# 047031UC  
Revised 4/15/97

SALES OFFICE  
(301) 975-1000  
TECHNICAL SUPPORT  
(301) 975-1007  
<http://www.patton.com>

## 1.0 WARRANTY INFORMATION

**Patton Electronics** warrants all Model 1004A components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse or unauthorized modification. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Patton Electronics** be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product. **Patton Electronics** specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

### 1.1 RADIO AND TV INTERFERENCE

The Model 1004A generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. The Model 1004A has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Model 1004A does cause interference to radio or television reception, which can be determined by disconnecting the RS-232 interface, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

### 1.2 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

## 1.3 SERVICE

All warranty and non-warranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Service: **(301) 975-1007**, <http://www.patton.com>; **support@patton.com**. *Packages received without an RMA number will not be accepted.*

Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Model 1004A. Technical Service hours: **8AM to 5PM EST, Monday through Friday.**

## 2.0 GENERAL INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Patton Electronics Technical Support at (301) 975-1007.

### 2.1 FEATURES

- Operates asynchronously, point to point or multipoint, over 2 or 4 wires
- Up to 50 multipoint device drops in a polling environment
- Data rates to 115.2 Kbps
- Passes transmit & receive data, one control signal each direction
- No AC power or batteries are required
- Variable high/low impedance settings
- Able to operate with or without "echo"
- Carrier can be set as "constantly on" or "controlled by RTS"
- Compact size ( 2.66" x 2.10" x 0.73")
- Twisted pair connection via strain relief, RJ-11 or RJ-45
- Silicon Avalanche Diode surge protection

### 2.2 DESCRIPTION

**The Model 1004A High Speed, Multipoint Short Range Modem** provides exceptional versatility in a compact package. Requiring no AC power or batteries for operation, the Model 1004A supports asynchronous RS-232 data rates to 115.2 Kbps over one or two unconditioned twisted pair. Distances up to 15.0 miles are attainable at lower data rates (1.2 Kbps, 19 AWG twisted pair).

The Model 1004A can handle up to 50 terminal drops in a multipoint polling environment. For RS-485 and serial printer applications requiring hardware handshaking, the Model 1004A passes one control signal in each direction. The Model 1004A may be configured for high or low impedance operation, carrier may be set to "constantly on" or "controlled by RTS", and the unit can operate with or without "echo". RTS/CTS delay may be set for "no delay" or 8 mS.

Options for twisted pair connection include terminal blocks with strain relief, RJ-11, RJ-45 and dual modular connectors for daisy chaining. Silicon Avalanche Diodes provide 600 watts per wire of protection against harmful data line transient surges.

## 3.0 CONFIGURATION

The Model 1004A is configured using an eight position DIP switch and a DCE/DTE switch. Figure 1 (below) shows the location of the DCE/DTE switch (externally accessible) on the PC board, as well as the power supply daughterboard and terminal block.

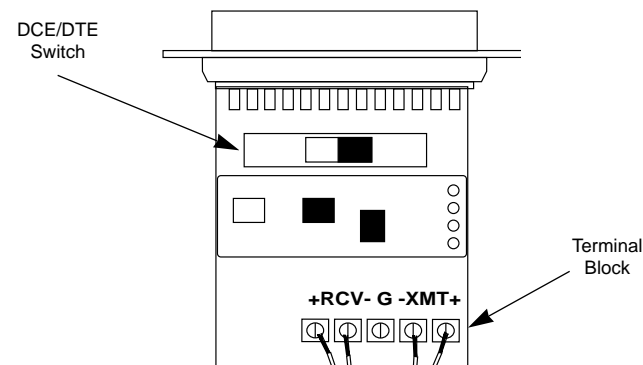


Figure 1. Top view of Model 1004A board, showing DCE/DTE switch.

Figure 2 (below) shows the location of the eight position DIP switch on the underside of the Model 1004A PC board. Figure 3 (opposite page) shows the orientation of the eight position DIP switch, with respect to ON/OFF positions.

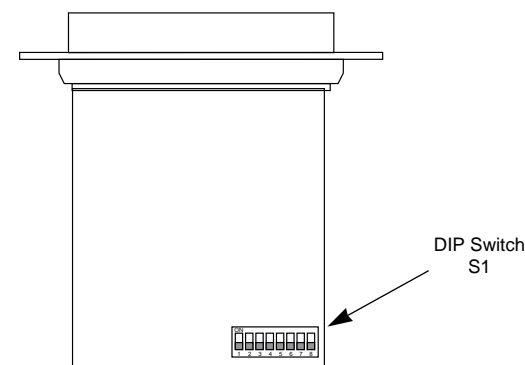


Figure 2. Bottom view of Model 1004A board, showing (internal) DIP switch.

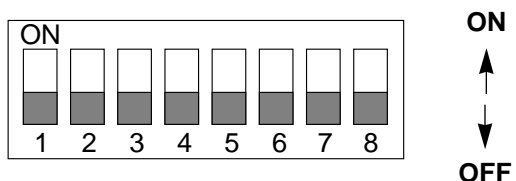


Figure 3. Close-up of DIP switch showing "ON" and "OFF" positions

### 3.1 SETTING THE DCE/DTE SWITCH

For your convenience, the Model 1004A has an externally accessible DCE/DTE switch. If the device connected to the Model 1004A is a modem or multiplexer (or is wired like one), set the switch to "DTE". This setting causes the Model 1004A to behave like Data Terminal Equipment and transmit data on pin 2. If the device connected to the Model 1004A is a PC, terminal or host computer (or is wired like one), set the switch to "DCE". This setting causes the Model 1004A to behave like Data Communications Equipment and transmit data on pin 3.

### 3.2 DIP SWITCH CONFIGURATION

The eight switches on switch set S1 (see Figure 3, above) configure the Model 1004A for echo mode, carrier control method, RTS/CTS delay, "transmit off" impedance, receive impedance, and 2-wire/4-wire operation. These switches are located *internally* on the Model 1004A's PC board. To access switch set S1, use a small flat blade screwdriver to pop open the Model 1004A's case as shown in Figure 4, below.

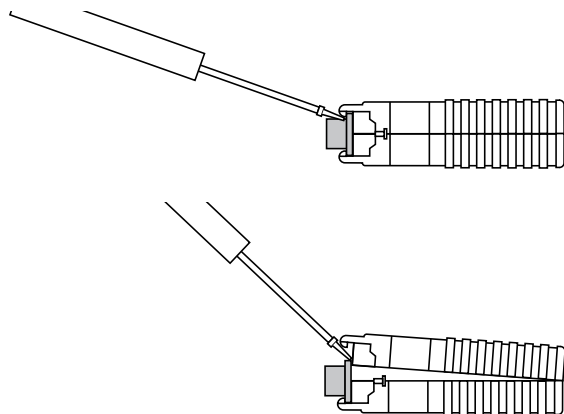


Figure 4. Opening the Model 1004A's plastic case with a small screwdriver

### 3.3 DIP SWITCH SETTINGS

All possible settings for the Model 1004A's configuration switches are presented in the table below. Following the table is a detailed description of each switch function. If you have additional questions, contact Technical Support at (301) 975-1000.

S1 SUMMARY TABLE			
Position	Function	Factory Default	
S1-1*	"Transmit Off" Impedance	Off	} High Z
S1-2*	"Transmit Off" Impedance	Off	
S1-3	RTS/CTS Delay	On	8 msec
S1-4	"ECHO" Mode	Off	Echo Off
S1-5	Carrier Control	Off	Constantly On
S1-6	Receive Impedance	On	120 Ohm
S1-7*	2-Wire/4-Wire	Off	} 4-Wire
S1-8*	2-Wire/4-Wire	Off	

**\*Note:** Switches S1-1 & S1-2 should be switched simultaneously. Switches S1-7 & S1-8 should also be switched simultaneously.

#### S1-1 and S1-2: "Transmit Off" Impedance

Switches S1-1 and S1-2 are set together to determine whether the receiving device "sees" the impedance of the Model 1004A's transmitter as being "high" or "intermediate" when the transmitter is turned off. The "intermediate" setting is useful in half-duplex environments where the receiving device does not respond well to the "high" setting.

<u>S1-1</u>	<u>S1-2</u>	<u>Setting</u>
On	On	Intermediate Impedance
Off	Off	High Impedance

#### S1-3: RTS/CTS Delay

The setting for switch S1-3 determines the amount of delay between the time the Model 1004A "sees" RTS and when it sends CTS. **Note:** RTS/CTS Delay setting should be based upon transmission timing.

<u>S1-3</u>	<u>Setting</u>
On	8 mSec
Off	no delay

#### S1-4: Echo Mode

The setting for switch S1-4 determines whether the Model 1004A echoes data back to the transmitting device (half-duplex mode only).

<u>S1-4</u>	<u>Setting</u>
On	Echo On
Off	Echo Off

#### S1-5: Carrier Control Method

The setting for switch S1-5 determines whether the carrier is “Constantly On” or “Controlled by RTS”. This setting allows for operation in switched carrier, multipoint and/or hardware handshaking applications.

<u>S1-5</u>	<u>Setting</u>
On	Controlled by RTS
Off	Constantly On

#### S1-6: Receive Impedance

The setting for switch S1-6 selects the impedance of the input receiver. You may select either a “low” impedance of 120 Ohms or a “high” impedance of 16 kOhms. By selecting the proper impedance for each drop, there may be up to 50 receivers in one application.

<u>S1-6</u>	<u>Setting</u>
On	Low (120 Ohm)
Off	High (16 kOhm typical)

#### S1-7 and S1-8: 2-Wire/4-Wire Modes

Switches S1-7 and S1-8 are set together to determine whether the Model 1004A is in 2-wire or 4-wire operating mode. **Note:** 2-wire mode is half-duplex only.

<u>S1-7</u>	<u>S1-8</u>	<u>Setting</u>
On	On	2-wire mode
Off	Off	4-wire mode

### 3.4 CONFIGURATION SWITCH APPLICATIONS

The switch settings *generally* needed to configure the Model 1004A for various applications are shown in the table below. **Note:** Do not change switch settings until you have *carefully* read **Section 3.3**.

TYPICAL MODEL 1004A APPLICATIONS					
Switch Settings	Point-to-Point			Multi-point	
	4W	4W HDX	2W	4W	2W
S1-1: "Xmt Off" Imp. S1-2: "Xmt Off" Imp.	OFF OFF	OFF OFF	OFF OFF	OFF OFF	OFF OFF
S1-3: RTS/CTS Delay	ON	ON	ON	OFF	ON
S1-4: Echo	OFF	OFF	OFF	OFF	OFF
S1-5: Carrier Control	OFF	ON	ON	Master-OFF Slaves-ON	ON
S1-6: Rcv Impedance	ON	ON	ON	Master - ON Slaves - OFF Last Slave - ON	
S1-7: 2-wire/4-wire S1-8: 2-wire/4-wire	OFF OFF	OFF OFF	ON ON	OFF OFF	ON ON

## 4.0 INSTALLATION

Once the Model 1004A is properly configured, it is ready to connect to your system. This section tells you how to properly connect the Model 1004A to the twisted pair and RS-232 interfaces, and how to operate the Model 1004A.

### 4.1 TWISTED PAIR CONNECTION

The Model 1004A supports point-to-point or multipoint communication over one or two twisted pair. There are two essential requirements for installing the Model 1004A:

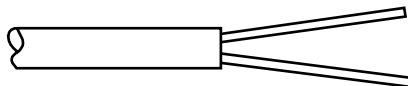
1. These units work in **pairs**. Therefore, you must have one Model 1004A at each end of a one or two twisted pair interface. In multipoint environments, there must be one Model 1004A at the RS-232 host and one at each RS-232 terminal.
2. To function properly, the Model 1004A needs one or two twisted pair of metallic wire. These pairs must be **unconditioned** dry metallic wire, between 19 and 26 AWG (the higher number gauges may limit distance). Standard dial-up telephone circuits, or leased circuits that run through signal equalization equipment, are *not acceptable*.

For your convenience, the Model 1004A is available with several different twisted pair interfaces: RJ-11 jack, RJ-45 jack, terminal blocks with strain relief and dual modular jacks (for multipoint daisy-chaining).

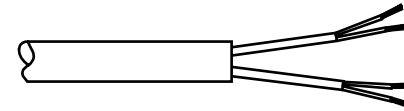
#### 4.1.1 TWISTED PAIR CONNECTION USING TERMINAL BLOCKS

If your application requires you to connect one or two pairs of bare wires to the Model 1004A, you will need to open the case to access the terminal blocks. The following instructions will tell you how to open the case, connect the bare wires to the terminal blocks and fasten the strain relief collar in place so the wires won't pull loose.

1. You should already have the case open for the configuration procedure. If not, see Section 3.2.
2. Strip the outer insulation from the twisted pair(s) about one inch from the end.



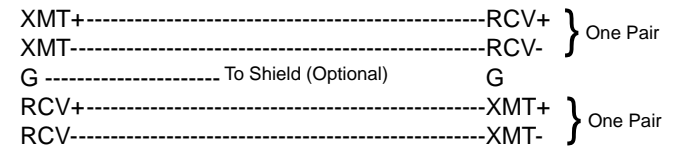
3. Strip the insulation on each of the twisted pair wires about .25".



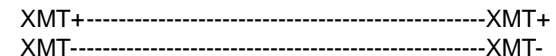
4. In a **two pair circuit**, connect *one pair* of wires to XMT+ and XMT- (transmit positive and negative) on the terminal block, making careful note of which color is positive and which color is negative.

5. Connect the *other pair* of wires to RCV+ and RCV- (receive positive and negative) on the terminal block, again making careful note of which color is positive and which color is negative.

Ultimately, you will want to construct a two pair crossover cable that makes a connection with the two Model 1004As as shown below.

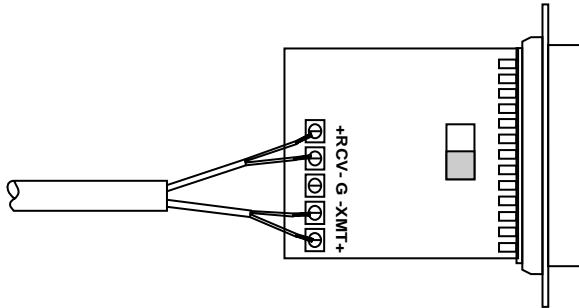


6. In a **single pair circuit**, use *only the transmit (XMT) pair* as shown below:

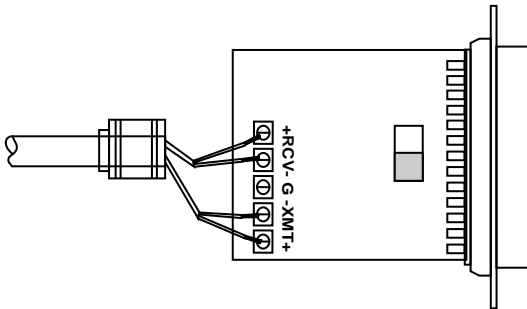


7. If there is a shield around the telephone cable, it may be connected to "G" on the terminal block. To avoid ground loops, we recommend connecting the shield at the computer end only. A ground wire is *not necessary* for proper operation of the Model 1004A.

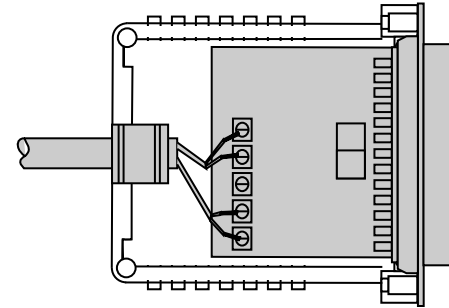
8. When you finish connecting the wires to the terminal block, the assembly should resemble the diagram below:



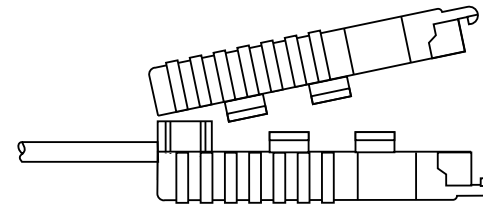
9. Place the 2 halves of the strain relief assembly on either side of the telephone wire and press together very lightly. Slide the assembly so that it is about 2 inches from the terminal posts and press together firmly. If your cable diameter is too small or too large for our strain relief, please contact our technical support. We have strain relief assemblies to accommodate most cable diameters.



10. Insert the strain relief assembly and wire into the slot in the bottom half of the modem case. Set it into the recess in the case.



11. BEND the top half of the case as necessary to place it over the strain relief assembly. Do not snap the case together yet.



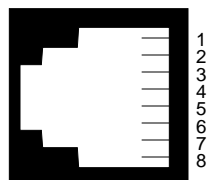
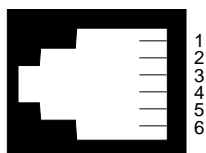
12. Insert one captive screw through a saddle washer. Then insert the entire piece through the hole in the DB-25 end of the case. Snap that side of the case closed. Repeat the process for the other side. This completes cable installation.

#### 4.1.2 TWISTED PAIR CONNECTION USING RJ-11 OR RJ-45

The RJ-11 and RJ-45 connectors on the Model 1004A's twisted pair interface are pre-wired for a standard TELCO wiring environment. The signal/pin relationships are shown below:

<u>RJ-11</u>	<u>SIGNAL</u>	<u>RJ-45</u>	<u>SIGNAL</u>
1 .....	GND†	1 .....	N/C
2 .....	RCV-	2 .....	GND
3 .....	XMT+	3 .....	RCV-
4 .....	XMT-	4 .....	XMT+
5 .....	RCV+	5 .....	XMT-
6 .....	GND	6 .....	RCV+
		7 .....	GND
		8 .....	N/C

†Connection to ground is optional



When connecting two Model 1004A's, it is necessary to use a crossover cable. The diagrams below show how a crossover cable should be constructed for the following environments: 4-wire RJ-11, 4-wire RJ-45, 2-wire RJ-11 or 2-wire RJ-45.

##### RJ-11 Cable (4-Wire)

<u>SIGNAL</u>	<u>PIN#</u>	<u>PIN#</u>	<u>SIGNAL</u>
GND†	1-----	6	GND†
RCV-	2-----	4	XMT-
XMT+	3-----	5	RCV+
XMT-	4-----	2	RCV-
RCV+	5-----	3	XMT+
GND†	6-----	1	GND†

†Connection to ground is optional

##### RJ-45 Cable (4-Wire)

<u>SIGNAL</u>	<u>PIN#</u>	<u>PIN#</u>	<u>SIGNAL</u>
GND†	2-----	7	GND†
RCV-	3-----	5	XMT-
XMT+	4-----	6	RCV+
XMT-	5-----	3	RCV-
RCV+	6-----	4	XMT+
GND†	7-----	2	GND†

##### RJ-11 Cable (2-Wire)

<u>SIGNAL</u>	<u>PIN#</u>	<u>PIN#</u>	<u>SIGNAL</u>
XMT+	3-----	3	XMT+
XMT-	4-----	4	XMT-

##### RJ-45 Cable (2-Wire)

<u>SIGNAL</u>	<u>PIN#</u>	<u>PIN#</u>	<u>SIGNAL</u>
XMT+	4-----	4	XMT+
XMT-	5-----	5	XMT-

†Connection to ground is optional

## 4.2 WIRING FOR MULTIPOINT CIRCUITS

The Model 1004A supports multi-point applications using either a star or daisy chain topology. Both topologies require special wiring, as well as specific DIP switch settings for master and slave units. **Note:** Refer to Section 3.2.2 for multipoint DIP switch settings.

### 4.2.1 STAR TOPOLOGY

Using a star topology, you may connect several Model 1004As together in a master/slave arrangement. Maximum distance between the units will vary based upon the number of drops, data rate, wire gauge, etc. Call Technical Support for specific distance estimates.



Figure 5 (below) shows how to wire the two-pair cables properly for a Model 1004A star topology. Note that the ground connection is not needed.

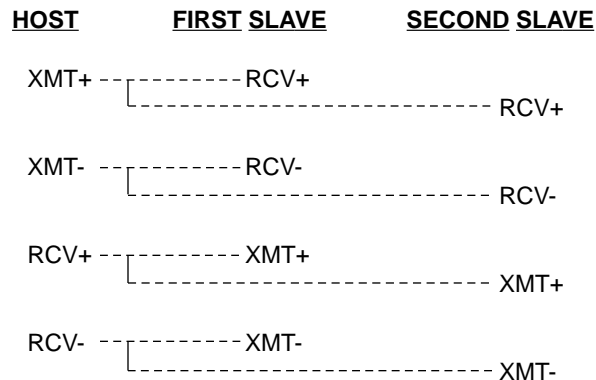


Figure 5. Star wiring for Model 1004A host and slaves

#### 4.2.2 DAISY CHAIN TOPOLOGY

Using a daisy chain topology, you may connect several Model 1004As together in a master/slave arrangement. Maximum distance between the units will vary based upon the number of drops, data rate, wire gauge, etc. Call Technical Support for specific distance estimates.

Figure 6 (below) shows how to wire the two-pair cables properly for a Model 1004A daisy chain topology. Note that the ground connection is not needed.

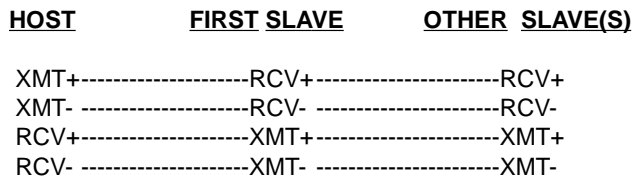


Figure 6. Daisy chain wiring for Model 1004A host and slaves

#### Optional Connection: Dual Modular Jacks

To facilitate daisy chaining, the Model 1004A is available in a “DRJ11” (dual RJ-11) or “DRJ45” (dual RJ-45) version. These units have two specially wired modular jacks for twisted pair connection.

With the dual modular units, you won't need to build cumbersome “Y” cables for your daisy chain application. Simply use a **crossover** cable to go between the host and the first slave (see Section 4.1.2 for crossover cable wiring instructions), and **straight through** cables between the slaves.

#### 4.3 CONNECTION TO THE RS-232 INTERFACE

Once you have properly configured the Model 1004A and connected the twisted pair wires correctly, simply plug the Model 1004A directly into the DB-25 port of the RS-232 device. Remember to insert and tighten the two captive connector screws.

(Note: If you must use a cable to connect the Model 1004A to the RS-232 device, make sure it is a *straight through* cable of the shortest possible length—we recommend 6 feet or less).

#### 4.4 OPERATING THE MODEL 1004A

Once the Model 1004A is properly installed, it should operate transparently—as if it were a standard cable connection. Operating power is derived from the RS-232 data and control signals; there is no “ON/OFF” switch. All data signals from the RS-232 and RS-485 interfaces are passed straight through. Additionally, one hardware flow control signal is passed *in each direction*.

## APPENDIX A

### PATTON MODEL 1004 SPECIFICATIONS

<b>Transmission Format:</b>	Asynchronous
<b>Data Rate:</b>	Up to 115,200 bps
<b>Range:</b>	Up to 9 miles
<b>Serial Interface:</b>	DB-25, male or female (DCE/DTE switchable)
<b>Transmit Line:</b>	2, 4 wire unconditioned twisted pair
<b>Transmit Mode:</b>	4-wire, full or half duplex; 2-wire half duplex
<b>Control Signals:</b>	DSR turns "ON" immediately after the terminal raises DTR; DCD turns "ON" after recognizing the receive signal from the line; CTS turns "ON" after the terminal raises RTS.
<b>RTS/CTS Delay:</b>	8 mSec or "no delay"
<b>Carrier:</b>	The carrier is switch selected either continuous operation or switched operation, controlled by RTS
<b>Surge Protection:</b>	600W power dissipation at 1 mS
<b>Power:</b>	Draws operating power from RS-232 data and control signals; no AC power or batteries required.
<b>Temperature:</b>	0 to 50° C
<b>Humidity:</b>	5 to 95%, non-condensing
<b>Size:</b>	2.66" x 2.10" x 0.73"

Model 1004A Distance Table (miles)				
Data Rate (kbps)	Wire Gauge			
	19	22	24	26
115.2	3.5	2.6	1.4	0.9
38.4	5.0	2.9	2.2	1.5
9.6	7.1	4.6	3.5	2.8
1.2	9.0	6.5	5.0	3.9

## APPENDIX B

### PATTON MODEL 1004A RS-232 PIN CONFIGURATIONS

DIRECTION	"DCE" SETTING	DIRECTION
To 1004A	<p>1- (FG) Frame Ground 2- (TD) Transmit Data 3- (RD) Receive Data 4- (RTS) Request to Send 5- (CTS) Clear to Send 6- (DSR) Data Set Ready 7- (SG) Signal Ground 8- (DCD) Data Carrier Detect Data Term. Ready (DTR) - 20</p>	<p>To 1004A From 1004A To 1004A From 1004A From 1004A From 1004A</p>

DIRECTION	"DTE" SETTING	DIRECTION
From 1004A	<p>1- (FG) Frame Ground 2- (TD) Transmit Data 3- (RD) Receive Data 4- (RTS) Request to Send 5- (CTS) Clear to Send 6- (DSR) Data Set Ready 7- (SG) Signal Ground 8- (DCD) Data Carrier Detect Data Term. Ready (DTR) - 20</p>	<p>From 1004A To 1004A From 1004A To 1004A To 1004A To 1004A</p>